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AUTHOR Lin, Pei-Yu
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ABSTRACT

The purpose of this study is to identify and determine the extent of technological change in the development of automation as it is reflected in the professional literature and the rates at which males and females contribute to this literature. A database search of Library Literature on WILSONDISC was undertaken to identify publications written in the area of academic library automation for the years 1984-85 and 1990-1991. A total of 240 articles from the 1,198 citations identified were selected for content analysis, and coded data on author gender and article topic were input into MINITAB to derive statistics. A t-test was conducted to determine if there was a statistically significant difference in terms of publishing output of females and males. Chi square analysis was performed to find the relationship of subject coverage to period. Of the 303 writers and editors whose gender could be identified, 54% were female and 46% male. Female authors decreased their rate of publication from 1984-85 to 1990-1991 by 5% while the male rate increased by about the same amount. The average publication output of female authors in both time periods was about five pages, while that of males was about seven. Articles were coded according to five broad subject areas and analyzed accordingly: 50% were assigned to subjects related to library operations; 21% percent to aspects of automation of library processes; 29% to information technology, 24% to information systems, and 12% to end users. Over the two periods of time, there was a significant increase in the number of articles assigned to the subject of reference services and a decrease in the articles on circulation. Articles related to optical technology increased the most over the two periods. Outlines of study procedures and a list of the journals from which citations were sampled are appended. (Contains 23 references.) (KRN)

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Analyzing Library Literature on Academic Library Automation: Authorship and Subject Coverage

A master's Research Paper submitted to
the Kent State University School of Library and Information
Science in partial fulfillment of the requirements for the degree
Master of Library Science

By

Pei-Yu Lin

July, 1992

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ABSTRACT

Twenty-four citations related to the topic of academic library automation, searched from *Library Literature* on WILSONDISC for the years 1984-1985 and 1990-1991, were analyzed with respect to subject coverage, the gender of authors, and publication sources. A content analysis was performed to identify the technological changes and trends in the development of automation as they are represented in these citations. It was found that the articles in information services are heavily distributed in the literature on academic library automation. The findings of this study suggest significant gender differences in the publication output on the subject of automation. No core journals on the topic of academic library automation can be conclusively supported by the data analyzed.

Master's Research Paper by

Pei-Yu Lin

B.S., The National Taiwan Normal University, 1986

M.A., The Ohio State University, Columbus, 1990

M.L.S., The Kent State University, Kent, 1992

Approved by

Adviser_____Date_____

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I. INTRODUCTION

During the past two decades, a technological revolution has been occurring in academic libraries. Automation has been identified as one of the two subjects addressed most frequently in the Chronicle of Higher Education, an essential current-awareness tool for events in academy (Rice and Paster 1990). By 1990, a CD-ROM revolution in the Chronicle's automation coverage had been acknowledged for at least two years.

Writers in the field of automation (Martin 1989, Morris 1989, Corbin 1991) have observed that, in terms of automation or technologies adopted in the society, there are three stages that have evolved over time: (1) first, people automate or mechanize what they have been doing manually; (2) second, they devise new uses and ways of doing things and change the organization of what they are doing; and (3) third, society changes in response to these forces.

In the first stage, familiar things that have traditionally been done manually are continued on an automated basis and are now done faster and better. This stage dates back before the 1970s in terms of library automation.

In the second stage, the tasks themselves change because technology has revised what has been done. In the late 1970s and 1980s, what libraries had automated had changed the way libraries work. For example, database search services were moving reference librarians into stage two as they performed tasks very different from traditional duties (Morris 1989).

In the last stage, the technology causes society itself to change and, as a result, fundamental changes in life style occur.

Corbin (1991) pointed out that this final stage is emerging with the development of networks on a local, regional, national, and international scale. Libraries are becoming part of a changing world of information technology in which the users of information are beginning to access and use information differently than they did in the past (Martin 1989).

If technological automation in libraries has undergone a period of transition or even revolution, it would seem that the literature related to the subject would also reflect patterns or trends that represent this dynamic process. No insightful analysis of literature on automation in academic libraries has been accomplished. There is not a clear picture depicting how information technology approaches such as national networking, LANs, turnkey systems, adoption of online system, etc. are changing, and how library functions (e.g. circulation, acquisitions, serials control, cataloging, etc.) have been impacted by these approaches over time.

Purpose of the Study

The purpose of this study is to identify and determine the extent of technological changes and trends in the development of automation as they are represented in the professional literature. The following research questions are posed:

1. Is the literature on some automation-related topics increasing over time?
2. Is the literature on some automation-related topics decreasing over time?
3. Is there a difference in the amount of library literature

published by males and females?

4. Do females tend to increase their publication rate on the subject of automation.

Definition of Terms

In this study the following terms will be defined as follows:

Library automation is defined broadly as any activities applying information technology to serve operational and service purposes of the library. This definition does not support De Gennaro's (1985) distinguishment between library automation and information automation. According to him, information automation provides access to information resources outside the library; for this study, the goal of library automation is to provide resources within the library.

Academic library automation refers to the applications of information technology to routine operations and services in academic libraries excluding school libraries.

It has been assumed that literature trends of automation development in academic libraries can be analyzed in two perspectives: library automated tasks and technology approaches.

Library automated tasks refer to the traditional or new operations or services in libraries utilizing information technology, such as interlibrary loan, circulation, acquisitions, special collections, administration, cataloging, etc.

Technology Approaches refer to any specific or general systems or information innovations applied in library operations and services, such as CD-ROM stations, LANs, OPACs, national networking, bibliography utilities, etc.

Limitations of the Study

The present study will only be concerned with automation as it affects the academic library and with literature that is analyzed in Library Literature. Therefore, the findings are not necessarily generalizable to all library settings or to literature that appears in publications not analyzed in this index.

II. REVIEW OF THE LITERATURE

Libraries have long sought technological aids to facilitate and enhance their services. Library automation can actually be traced back to the introduction of the typewriter into libraries in the late 1800s (Reynolds 1985). Automation of the library can be seen as an evolving process of adopting technologies rather than just an event that occurred only once (Olsgaard 1989).

It has been indicated that there are three stages evolving in the adoption of technologies to society (Martin 1989, Morris 1989, Corbin 1991). The rise of good, inexpensive, rapid, long-distance electronic technologies is changing the patterns of librarianship. Morris (1989) indicated that most libraries are experiencing the first phase of technological change as they mechanize the traditional library operations, and now are entering the second phase of technological change as they change the tasks of library work, such as the provision of database searching service in the reference department. New services are expected along with the adoption of technology in libraries.

Literature on library automation has focused until the mid-1980s on those computer-based systems that handle library management activities such as circulation, acquisitions, cataloging, serials control, and interlibrary loan (Shaw and Culkin 1987). It is claimed that information automation has been transferred to library automation and speeding its development (De Gennaro 1985). Automated information services was expected as the automation of traditional library processes developed.

Bois Yavitz has developed an analysis technique that traces growth in automation applications through levels of computer

exploitation (Johnson 1991). Computer uses at level one are generated toward improvement of exiting services. The objectives at this level include using the computer to speed up responses, increasing accuracy and access to information, improving services, and reducing costs. New services and operations that further exploit computer ability are introduced at level two. At level three, the organization applies computers to areas of management decision-making. However, Olsgaard (1989) pointed out that most automated systems in libraries generate a variety of statistical reports that can and should be, but probably are not, used in planning library operations, as indicated by Johnson (1991).

The shape of the library services and operations is changing and being reformed by the impact of technological development. During the infancy of library automation, the 1940s and 1950s, the purpose of automation with the application of machine readable file and computers for library was to mechanize the manual operations, where the system was off-line and the automation of internal operation was focused on circulation procedures (Reynolds 1985, Saffady 1989a). In the 1960s, automation development of libraries moved beyond the punched card storage device for computer operation, but remained as an off-line operation, with the overall concern to replace manual work to save time, money, and labors, and with a great achievement in bibliographic communication in machine readable format (Reynolds 1985, Saffady 1989b). In the 1970s, online support systems were common in general, and the integrated systems for technical processing as well as reference applications of information online retrieval systems emerged, with a big accomplishment in online cataloging

(Reynolds 1985, Saffady 1989a). During the 1980s, automation development in libraries moved beyond the focus on internal library operations and centralized operation systems, to an emphasis on public access and integrated information system (Reynolds 1985, Saffady 1989b). Some literature indicated that local decentralized systems would be integrated into centralized systems in the future with common user-friendly functions (Shaw and Culkin 1987, Potter 1990, Senzig and Bright 1989). After overviewing the main achievements of library automation in each decade, the development of library automation was found to be parallel to the development of information technology.

The literature indicated that the emergence of microcomputers played a dramatic role in the development of library automation systems. Lundeen and Davis (1982) predicted that the 1980's development trend would be parallel with the growing interests in microcomputer applications and more powerful minicomputer-based systems. Although Local Area Networks (LANs) can not represent an integration of microcomputers into information systems, they do permit their use around the edges. Microcomputers were expected to fundamentally influence the development of large information systems. Shaw and Culkin (1987) indicated that, as LANs were emerging, systems should be developed as the channel to local sources, external systems, nonbibliographic data, and electronic publishing.

The studies of library literature for publishing characteristics have been prolific recently. Studies by using the citations from Library Literature can trace back to Masse Bloomfield's (1980) quantitative study of the publishing

characteristics of librarians. He utilized the citations as means to determine the publication activities of librarians.

The studies most related to the current study regarding the subject coverage are Atkins' (1988), Buttlar's (1991) Feehan et al. (1987) and Rice and Plaster's (1990). It has been acknowledged by all of them that the subject of automation is distributed highly among library literature. Rice and Plaster recognized that the subject of automation was associated most among the Chronicle's. Feehan et al.. found as much as 28.5% of their sample dealt with automation, and Buttlar confirmed as much as 20 % of her sample dealt with automation-related topics. Atkins found that library automation is one of the three topics booming most among his sample. However, since this study only examines library literature dealing with automation, it may be hard to generate comparisons of this study to those mentioned.

Many research reports provide evidence of gender difference in the use and attitude toward the new technology. For example, Dambrot's (1985) study indicates that women are more afraid of computers than men. However, some studies reported no gender difference in term of computer confidence, and computer liking (Koohang 1986). There have been several studies related to the productivity of female librarians. DuMont and DuMont (1989) hypothesized that female librarians are less interested in technology than males and thus that this difference may be one factor inhibiting female mobility into managerial positions. Buttlar (1991) found that more female authors contribute to the literature on the subject of automation. Varlejs and Darlymple (1986) found that the ratio of male faculty to female faculty

distributed in information science-oriented publication is three to one. Their striking finding indicating that male productivity of scholarly publication is greater than female's is discussed in the body of literature investigating gender difference in the publication output.

Some studies analyzing authorship of library literature indicate a closing of the gap between female and male publication rate. Zamora and Adamson (1982) found that female authorship in Special Libraries increased 4.3% per year from 1969 to 1979 and more females published in Online from 1977 to 1979. Buttlar (1991) confirmed a slowly closing gap between the proportions of male and female contributors, especially among special librarians.

III. METHODOLOGY

The methodology employed in this study is that of content analysis. The professional literature analyzed in Library Literature for the years 1984-1985 and 1990-1991 was analyzed to determine the extent of coverage given to the topic of academic library automation, the gender of the authors who write on this topic, the types of publications published in this area, as well as trends in various subdivisions of the subject. Citations of Library Literature on WILSONDISC were analyzed with respect to frequency of this information. In addition, the statistical package of MINITAB was used to analyze the coded data and to provide the descriptive and inferential statistics applied to answer the research questions addressed in this study.

Data Collection

In an effort to identify publications written in the area of academic library automation in English over two periods, a database search of Library Literature on WILSONDISC was undertaken for the years 1984-1985 and 1990-1991.

A total of 10,150 citations about academic libraries was derived from the search of Wilsonline made by using Boolean operators to combine the words of academic, university and college in the basic index and then to exclude the terms of school libraries, public libraries, special libraries and corporate libraries in free text of the database (See Strategy for Population Identification in Appendix I). In order to pull out the citations most relevant to academic library automation, only the word "automation" in the basic index of the database was

chosen to be the search key. By combining the key word of automation with those 10,150 citations, a total of 1198 citations on academic library automation was identified.

The potential population for this study included 1198 citations on the topic of academic library automation for a coverage from 1984 through 1992. Some are not in English, and some are book review articles without subject coverage included in their citations. By using the qualifiers of Wilsonline mode, these citations were excluded for the tentative population. In summary, a total of 1092 citations represented the final search results on the topic of academic library automation in English excluding book review articles from 1984 through 1992.

In order to select the same amount of citation samples over two periods, the numbers of citations in each year of 1984, 1985, 1990, and 1991 were first identified by using the year qualifier to search among the tentative population, 1092 citations. The number of citations for each year were 61, 77, 189, and 110, respectively. As a result, four lists of these citations for each year were obtained. The citations in each list were in random order. A systematic sampling method was applied to derive 60 samples from each of the four lists. A total of 240 sampled citations was collected to represent library literature on academic library automation over two periods written in English.

Classification Scheme

The subject classification scheme developed in this study was designed on the basis of the terms used in the subject coverage of Library Literature citations on WILSONDISC. The subject terms

were extracted from the population citations of 1984, 1985 and 1990, and then were classified into six broader subject categories. The terms grouped in each broad subject category were mutually exclusive, and the broad subject categories were developed to be as exhaustive as possible. The resulting classification was then used to create a code book and tested on the samples. As the result of the pretest, the final scheme was adjusted as needed to allow each subcategory to be exclusive of one another under a broad category and reflect the developer's knowledge structure of library automation (See Classification Scheme in Appendix II).

Four categories, with respect to Subjects I, II, III, and IV in the code book, were developed in two perspectives of academic library automation: library automated tasks and technology approaches. Each broad subject category represents one perspective of library automation. Subject I represents library operations with applied technology, including subcategories such as reference services, technical services, circulation procedures, etc. Subject II represents various aspects of automation of academic library processes, including subcategories such as history, aims and objectives, psychological aspects, etc. Subject III represents information technology applied in academic libraries, including subcategories such as CD-ROM use, local area network, front-end systems (gateway), etc. Subject IV represents information systems adopted in academic libraries, including subcategories such as integrated library system, microcomputer systems, etc.

Two categories, with respect to Subjects V and VI in the code book, were developed to examine the distribution of samples in

terms of end-users' points of view and types of academic libraries. Subject V represents the perspective of the end-user in library literature, including subcategories such as end-user study, end-user searching, information retrieval in the social aspect, and online searching in general. Subject VI including types of academic libraries was designed to better understand the tentative population in this study.

The author gender classification scheme was developed to classify the gender of all writers and editors, as well as that of all single authors and co-authors.

Data Coding

Based on the pre-developed Code Book, each sampled citation was coded into various classifications with coding sheet (see Code Book in Appendix III, Coding Sheet in Appendix IV). Coding was conducted three different times to eliminate coding errors. The coder initially coded on the sampled citation lists, then on the coding sheet two times.

Author gender was coded on the basis of the first name of the authors and determined by using Popular Female and Male English Name in the Appendix of Random House Dictionary. In the case where the gender associated with the author's name was unclear, that author was assigned to the category "unknown." Names of the writers whose gender was unknown were recorded in coding sheet and double checked with one male and one female in the Lab of Kent State University Columbus Program. They only identified one author's gender among those authors whose gender were unknown by the coder.

The distribution of authors by gender was analyzed by computing the percentage of pages written for a total of 327 writers excluding editors. The total amount of pages was coded for each author. In the case that the publication written by multiple writers, pages for each author were coded by dividing the total pages by the number of writers. The total pages for each sampled publication was also coded for analyzing the distribution of subject coverage.

Each sampled citation was coded through each broad subject category, Subject I to Subject VI. Only the terms appearing in the Subject Coverage and the title of the sampled citations and matching the terms in the code book was coded. If no terms in those two fields matched with the terms used in the code book, unidentified subcategory (value 0) was coded for that sample in that broad category.

The sampled citation was coded systematically according to the coding rules developed (See coding rules in Appendix II). Special rules were developed in case two subcategories could be coded for the same citation in one broad category. For example, the terms of 'College and University Libraries/Automation' and 'College and University Libraries /German' appear in the same citation, that citation would be coded as College and University Libraries/Foreign Countries for Subject VI category (See Code Book in Appendix III).

Data about publication types and journal titles of the samples were coded separately with the above information about author gender and subject coverage. The reason is that there are more than 50 different journals which can be identified among the

240 citation sample. It was more efficient to identify journals and then count manually for the frequency distribution of publication by year and publication types and titles.

Data Analysis

Coded data in the coding sheet was input into MINITAB to derive descriptive and inferential statistics used to answer the research questions posed in this study.

Several worksheets of MINITAB were created to derive the frequency distribution as needed for this study. Since some samples were written by multiple writers but assigned with the same subject terms in the subject coverage, two separate worksheets were created to solve the problems of analyzing pages by each author as well as numbers of publication by the subject coverage for such cases. Two worksheets were created to analyze the total numbers of gender associated with writers including editors and the total pages of female and male writers excluding editors. Two worksheets were created by dividing citations of 1984-1985 and 1990-1991 in order to generate the frequency distribution by years.

A t-test was conducted to determine if there is a statistically significant difference in term of publishing output of females and males. Chi-square analysis was performed to find out the relationship of subject coverage to years.

Information about types of publication and titles of journals was analyzed manually. The frequency of publication by types of publishing and journal titles was counted three different times. Different titles of the same journal were counted as one journal.

IV. FINDINGS

Authorship

The sample of this study consists of 240 citations from Library Literature on WILSONDISC. Among these 240 citations, a total of 327 authors and editors was identified and analyzed.

As shown in Table 1, of 327 authors and editors, 165 are female (50.46%), 138 are male (42.20%), and 24 (7.34%) are those whose gender can not be identified by their first names. Excluding those unknown by gender, a total of 303 writer and editors consist of 54.46% female and 45.54% male (See Table 2). This finding confirms the recent study by Buttlar (1991) who found among a total of 106 authors publishing on the subject of automation that the percentage of women is 59.43 % and that of men's is 40.57 %.

Table 1

Distribution of Authors (and Editors) by Year and Gender.

Gender	1984-1985 (N = 170)		1990-1991 (N = 157)		Total (N = 327)	
	f	%	f	%	f	%
Female	88	51.77	77	49.05	165	50.46
Male	67	39.41	71	45.22	138	42.20
Unknown	15	8.82	9	5.73	24	7.34
Total 170	100.00		157	100.00	327	100.00

Table 2 provides information regarding the distribution of the gender of the authors and editors over two periods, 1984-1985 and 1990-1991. The number of total female authors 77 (52.03 %) publishing in 1984-1985 were less than that 88 (56.77 %) in 1990-1991. While females decrease their publication rate in the area of academic library automation by about 5 % over the two periods, male increase by about 5 %. As shown in table 3, both female and male publishing alone increased over the two periods, by 7 % and 10%, respectively. Both female and male co-authors decrease also, by 12% and 5%, respectively.

As shown in Table 4, excluding editors, every female contributes 4.96 pages of a total sampled publication, while every male contributes 7.05 pages. The t-ratio reveals a difference in the means for men and women to be significant at the .05 level of significance ($t=-2.20$, $p=.029$, $p<.01$, $t<2.660$). Gender differences statistically significant in total publication output of all authors excluding editors is supported by the data collected in this study.

Table 2

Distribution of Authors (and Editors) by Year and Gender.

Gender	1984-1985 (N = 155)		1990-1991 (N = 148)		Total (N = 303)	
	f	%	f	%	f	%
Female	88	56.77	77	52.03	165	54.46
Male	67	42.23	71	47.97	138	45.54
Total	155	100.00	148	100.00	303	100.00

Table 3

Distribution of Authors (and Editors) and Co-Authors by Year and Gender.

Gender	1984-1985 (N = 170)		1990-1991 (N = 157)		Total (N = 327)	
	f	%	f	%	f	%
Female Author	32	18.82	41	26.11	73	22.32
Female Co-Author	56	32.94	36	22.93	92	28.13
Male Author	35	20.59	48	30.57	83	25.38
Male Co-Author	32	18.82	23	14.65	55	16.82
Unknown	15	8.82	9	5.73	24	7.34
Total	170	100.00	157	100.00	327	100.00

Table 4

Distribution of Publication by Year and Gender.

Gender	1984-1985 (N = 170)			1990-1991 (N = 157)			Total (N = 327)		
	f	$\bar{X}$	SD	f	$\bar{X}$	SD	f	$\bar{X}$	SD
Female	87	4.50	4.02	76	5.50	5.21	163	4.96	4.63
Male	66	6.34	4.50	71	7.71	13.53	137	7.05	10.22
Total	170	6.46	14.76	157	8.89	33.23	327	7.62	25.35

Table 5

Distribution of Authors' and Co-Authors' Publication by Year and Gender.

Gender	1984-1985 (N = 170)			1990-1991 (N = 157)			Total (N = 327)		
	f	$\bar{X}$	SD	f	$\bar{X}$	SD	f	$\bar{X}$	SD
Female Author	31	7.29	5.4	40	7.57	6.0	71	7.45	5.7
Female Co-Author	56	2.95	1.6	36	3.2	2.9	92	3.05	2.1
Male Author	34	8.29	5.2	48	10.25	15.8	82	9.44	12.5
Male Co-Author	32	4.26	2.3	23	2.40	2.2	55	3.48	2.4
Unknown	15	4.53	2.3	9	2.92	2.1	24	3.92	2.3
Total	170	6.46	14.8	157	8.89	33.2	327	7.62	25.3

Table 5 shows that female authors publishing alone did not decrease their publication output (ranged from 7.29 pages to 7.57 pages per author excluding editor), while male authors publishing alone increase their output (ranged from 8.29 pages to 10.25 pages per author excluding editor). During 1984-1985, excluding editors, the output of co-authors per male (4.26 pages on the average) is larger than that of per female (2.95 pages on the average). However, female co-authors do not decrease their publication output over the two periods (ranged from 2.95 pages to 3.2 pages per co-author), while male co-authors decrease their publication output (ranged from 4.26 pages to 2.40 pages per co-author).

Publication Sources

Of 240 publications, 5 are books (2.08%), 19 are articles in monograph (7.91%), 27 are articles in conference proceedings (11.25%), 9 are articles in the publications of academic library (3.75%), 5 are articles in the bulletin of library association (2.08%), and 175 are journal articles (72.91%). Table 6 provides the distribution of publication by types of publishing over the two periods. Articles in monograph and conference proceedings are distributed more in 1984-1985 (15 articles or 12.50%; 21 articles or 17.50%) than in 1990-1991 (4 articles or 3.32%; 6 articles or 5.00%). As shown in Table 6, not as many journal articles were found during 1984-1985 (69 articles 57.50%) as during 1990-1991 (88.30%).

Table 6

Distribution of Publication by Types of Publishing.

Types of Publishing	1984-1985 (N = 120)		1990-1991 (N = 120)		Total (N = 240)	
	f	%	f	%	f	%
Monograph	3	2.50	2	1.66	5	2.08
Articles in Monograph	15	12.50	4	3.32	19	7.91
Conference Proceedings	21	17.50	6	5.00	27	11.25
Academic Lib Publication	7	5.82	2	1.66	9	3.75
Bulletin of Lib Assoc.	5	4.16	0	0.00	5	2.08
Journal Articles	69	57.50	106	88.30	175	72.91
Total	120	100.00	120	100.00	240	100.00

Table 7

Distribution of Publication by 19 Journals.

Journal Titles	Not Indexed	1984-1985 (N =69) f	%	1990-1991 (N =106) f	%	Total (N =175) f	%
Lib Software Review	*	0	0.00	10	9.43	10	5.71
Program		7	10.14	3	2.83	10	5.71
Serial Librarian		3	4.34	6	5.66	9	5.14
CD-ROM Professional	*	0	0.00	9	8.49	9	5.14
Coll. & Research Lib News		3	4.34	5	4.71	8	4.57
Computers in Lib	*	0	0.00	6	5.66	6	3.42
Journal of Lib Adm.	*	0	0.00	6	5.66	6	3.42
Library Journal		4	5.79	2	1.88	6	3.42
CD-ROM Librarians	*	0	0.00	5	4.71	5	2.85
LASIE		3	4.34	2	1.88	5	2.85
Online		2	2.89	3	2.83	5	2.85
Library Hi Tech		4	5.79	1	0.94	5	2.85
Library Acquisitions		3	4.34	2	1.88	5	2.85
LRTS		2	2.89	2	1.88	4	2.28
Machintoshed Library	*	0	0.00	4	3.77	4	2.28
OCLC Micro	*	0	0.00	4	3.77	4	2.28
RQ		4	5.79	0	0.00	4	2.28
Show-me Libraries		4	5.79	0	0.00	4	2.28
Technicalities		3	4.34	1	0.00	4	2.28
Total		69	100.00	106	100.00	175	100.00

* The asterisk indicates that the journal was not indexed in Library Literature in 1984-1985.

A total of 54 journals excluding the publications of academic libraries was identified among the total sampled publications (See 54 journal titles in Appendix V). Table 7 shows the distribution of 19 journals with more than three articles. The five journals with the largest distribution of articles are Library Software Review (10 articles or 5.71%), Program (10 articles or 5.71%), Serials Librarian (9 articles or 5.14 %), CD-ROM Professional (9 articles or 5.14%), and College and Research Library News (8 articles or 4.57%). There are 7 journals not indexed in Library Literature during 1984-1985. CD-ROM Professional was published after 1990. OCLC Micro was published after 1985. Of the 19 journals, only Journal of Library Administration, LRTS, and RQ were selected in the study of Buttlar as core journals to represent the major types of libraries and categories of library and information science.

Subject Coverage

Not any sampled citation was assigned enough subject terms in its subject coverage to be analyzed from all the tentative perspectives in this study, Subject I through Subject VI. Some citations assigned 5 subject terms in the subject coverage of the citation could not be analyzed with all the five broad subjects. Some assigned one or two subject terms were coded only in one or two broad subject categories. As shown in Table 8, of 240 articles, 120 articles are assigned the subjects related to library operations (50%), 50 are assigned the subjects related to the aspects of automation of library processes (20.83%), 70 articles are assigned the subjects related to information techno-

Table 8

Distribution of Publication by Year and Subject Categories.

Subject Categories	1984-1985 (N = 120)		1990-1991 (N = 120)		Total (N =240)	
	f	%	f	%	f	%
I. Library Operations	57	47.50	63	52.50	120	50.00
II. Aspects of Automation	21	17.50	29	24.17	50	20.83
III. Info. Technology	22	18.33	48	40.00	70	29.17
IV. Information System	30	25.00	37	30.83	67	23.75
V. End-user Study	15	12.50	13	10.83	28	11.67

Table 9

Distribution of Publication
by Year and Subjects of Types of Academic Libraries.

Types of Academic Libraries	1984-1985 (N = 120)		1990-1991 (N = 120)		Total (N = 240)	
	f	%	f	%	f	%
College and University	33	27.50	26	21.67	59	24.58
Foreign Libraries	14	11.67	20	16.67	34	14.17
Scientific and Technology	8	6.67	2	1.67	10	4.17
Medical Libraries	3	2.50	6	5.00	9	3.75
Law Libraries	2	1.67	2	1.67	4	16.67
Total	60	50.00	56	46.67	116	48.33

logy (29.17%), 67 articles are assigned the subjects related to information systems (23.75%), and only 28 articles are assigned the subjects related to end-users (11.67%).

Of 240 articles, 34 articles (14.17%) are related to foreign libraries, 10 articles (4.17%) are related to scientific and technology libraries, 9 articles (3.75%) are related to medical libraries, and 4 articles (1.67%) are related to law libraries (See Table 9).

As shown in Table 10, of 120 articles analyzed from the perspective of library operations, the number of articles related to public services (73 articles or 60.83%) are more than those related to technical services (40 articles or 33.33%). The articles contributed to the subjects of public services do not vary much over the two periods (ranged from 35 articles or 61.40% to 38 articles or 60.32%). However, there is a significant increase for the articles assigned the subject of reference services (ranged from 17 articles or 29.82% to 31 articles or 49.21%). Of the total 120 articles on library operations, the total number of articles contributed to reference services represents 40%. There is a decrease in the articles on circulation procedures (ranged from 10 articles or 17.54% to 2 articles or 3.17%).

Table 11 provides information regarding the distribution of 50 articles over the subjects related to different aspects possessed in the literature on automation of library processes. Of the 50 articles, an increase over the two periods is shown (21 articles; 29 articles). Only three articles were found related to historical studies in 1990-1991, and only three articles were

found related to teaching in 1984-1985. No automation-related topics increase dramatically over the two periods.

Table 10

Distribution of Publication
by Year and Subjects of Library Operations.

Library Operations	1984-1985 (N = 57)		1990-1991 (N = 63)		Total (N = 120)	
	f	%	f	%	f	%
Administration	1	1.75	3	4.76	4	3.33
Public Services	35	61.40	38	60.32	73	60.83
Reference Services	17	29.82	31	49.21	48	40.00
Interlibrary Loan	5	8.77	2	3.17	7	5.83
Circulation Procedures	10	17.54	2	3.17	12	10.00
Collection Development	13	5.26	3	4.76	6	5.00
Technical Services	19	33.33	21	33.33	40	33.33
Technical Services	1	1.75	2	3.17	3	2.50
Cataloging Services	7	12.28	10	15.87	17	14.17
Acquisition Services	8	14.04	9	14.29	17	14.17
Binding and Bookbinding	3	5.26	0	0.00	3	2.50
Archives	2	3.51	0	0.00	3	2.50
Preservation	0	0.00	1	1.59	1	0.83
Total	57	100.00	63	100.00	120	100.00

Table 11

Distribution of Publication
by Year and Subjects of Library Automation Aspect.

Automation Aspects	1984-1985 (N = 21)		1990-1991 (N = 29)		Total (N = 50)	
	f	%	f	%	f	%
Automation Study	4	19.05	9	31.03	13	26.00
Survey	2	9.52	2	6.90	1	2.00
Case Study	2	9.52	3	10.34	5	10.00
History	0	0.00	3	10.34	3	6.00
Management Aspects	1	4.76	3	10.34	4	8.00
Aims and Objectives	0	0.00	1	3.45	1	2.00
Administration	1	4.76	2	6.90	3	6.00
Human Aspects	7	33.33	6	20.69	13	26.00
Psychological Aspects	2	9.52	3	10.34	5	10.00
Teaching	3	14.29	0	0.00	3	6.00
Biblio. Instruction	2	9.52	3	10.34	5	10.00
Library Collection	7	33.33	9	31.03	16	32.00
Serial Collection	6	28.57	7	24.14	13	26.00
Reserve Collection	1	4.76	2	6.90	3	6.00
Document Delivery	1	4.76	2	6.90	3	6.00
Total	21	100.00	29	100.00	50	100.00

As shown in Table 12, the subjects related to optical technology increased the most over the two periods among the sample analyzed in the category of information technologies (ranged from 1 article or 4.54% to 21 articles or 43.75%). Database management systems (DBMS) are another subject increasing

Table 12

Distribution of Publication
by Year and Subjects of Information Technologies.

Information Technology	1984-1985 (N = 22)		1990-1991 (N = 48)		Total (N = 70)	
	f	%	f	%	f	%
Optical Technology	1	4.54	21	43.75	22	31.42
CD-ROM Use	1	4.54	19	39.58	20	28.57
CD-ROM Networking	0	0.00	2	4.16	2	2.85
Networking	9	40.90	8	16.66	10	14.28
Information Networks	7	31.81	3	6.25	5	7.14
Local Area Network	2	9.09	3	6.25	1	1.42
Telecommunication	0	0.00	1	2.08	1	1.42
E-Mail System	0	0.00	1	2.08	1	1.42
Computer Software	6	27.27	12	25.00	18	25.71
Computer Programs	5	22.72	1	2.08	6	8.57
HyperCard	0	0.00	2	4.16	2	2.85
DBMS	1	4.54	9	18.75	10	14.28
Computer Hardware	1	4.54	1	2.00	2	4.84
Computer Terminals	1	4.54	0	0.00	1	1.42
Computer Workstations	0	0.00	1	2.08	1	1.42
User-Friendly Technology	2	9.09	4	8.33	6	8.56
Front-End Systems	1	4.54	1	2.08	2	2.85
Expert Systems	1	4.54	3	6.25	4	5.71
Electronic Publishing	2	9.09	2	4.16	4	5.71
Total	22	100.00	48	100.00	70	100.00

significantly over the two periods (ranged from 1 article or 4.54% to 9 articles or 18.75%). In general, the sample analyzed in the category of information technology doubled in increase over the two periods (ranged from 22 articles to 48 articles). The proportion of the sample in the subject local area network in 1984-1985 (2 articles or 9.09%) is larger than that in 1990-1991 (3 articles or 6.25%).

Table 13

Distribution of Publication
by Year and Subjects of Information Systems.

Information Systems	1984-1985 (N = 30)		1990-1991 (N = 37)		Total (N = 67)	
	f	%	f	%	f	%
Library Systems	15	50.00	14	37.83	29	43.28
Integrated Systems	8	26.67	2	5.40	10	14.92
Microcomputer Systems	7	23.33	12	40.00	19	28.36
OPAC	8	26.66	8	26.66	16	23.88
Online Catalog	4	13.33	4	13.33	8	11.94
OPAC Systems	4	13.33	4	13.33	8	11.94
Information Systems	7	23.33	9	26.86	16	23.88
Inf. Service	4	13.33	5	13.51	9	13.43
Biblio. Utilities	3	10.00	4	13.33	7	10.45
Information Systems/ Special Subjects	0	0.00	6	16.27	6	8.95
Total	30	100.00	37	100.00	67	100.00

Table 13 indicates an increase of the subject of microcomputer systems (ranged from 7 articles or 23.33% to 12 articles or 40%) among 67 articles, and a decrease of the subject of integrated systems (ranged from 8 articles or 26.67% to 2 articles or 5.40%).

V. SUMMARY AND CONCLUSIONS

This study suggested that more articles dealt with public services than technical services. The increase of the subject terms of reference services and CD-ROM use over the two periods indicates that articles in information services are heavily distributed in the literature on academic library automation. It may imply that automation development in academic libraries has moved beyond the internal library operations and more new information services in the library are emerging with the use of technologies applicable nowadays, such as CD-ROM. As information technologies have developed so rapidly and become applicable in the library, it is interesting to note from this study that Database Management Systems (DBMS) and microcomputers are increasingly used in the library. However, this study does not support the notion that user-friendly technologies are popular among academic libraries. This finding is contradicted in the review of literature on library automation. Further investigation will be needed on this topic.

Since the analysis of the subject coverage is on the basis of citations from Library Literature on WILSONDISC, the analysis of subject coverage in this study is very much tied to the indexing of Library Literature. Among the 240 citations, a total of 173 subject terms could be coded for 1984-1985, while a total of 306 subject terms could be coded in 1990-1991. The bias created by the indexer of Library Literature may be reflected in the findings for this study. Obviously, more subject terms were assigned by the indexer in 1990-1991 regarding the topic of academic library automation. And certain terms, such as reference service/

automation, were assigned much more by the indexer in 1990-1991, while these subject terms may have been neglected or not used in 1984-1985 by the indexer. It would be interesting to compare the subjects of articles related to automation in this study to those of a future study.

No core journals on the topic of academic library automation can be conclusively suggested by this study. A total of 235 articles was distributed among 54 journals and academic library publications and bulletins of library automation. Among the 19 journals with more than 4 articles contributed, only a few were selected in other studies analyzing library literature, such as LRTS, Journal of Library Administration, Technicalities, Online, and RQ. Further investigation is needed for verification of core journals in the area of academic library automation.

The findings of this study suggest significant gender differences in the publication output on the subject of automation. However, this study can not suggest any cause of this finding. The relationship of female publication productivity to technology or automation needs further investigation. Both female authors and co-authors increased their publication output slightly over the two periods. It will be interesting to compare a longer period of time for the average output of female publication on the subject of automation.

The findings regarding the proportion of female and male contributors, 12:10 (54.46%, 45.54%), confirms Buttlar's (1991) findings, which show the ratio of female to male authors in the subject of automation is about 15:10 (59.43%, 40.57%). However, as Buttlar noted, the ratio of females to males in academic

librarianship is 3:1. Actually, a much larger percentage of males than females is publishing on the subject of automation.

No finding of this study suggests a closing of the gap between the proportions of male and female contributors, as found by Buttlar (1991) and Zamora and Adamson (1982). On the contrary, it was found that females decreased their publication rate on the subject of automation in this study. The decrease of females in 1990-1991 may be due to the fact that more females published alone and less females published with others in 1990-1991. That single male authors increased more than single female authors as well as the fact that male co-authors decreased less than female co-authors may explain the increase of males over the two periods.

APPENDIX I.

Strategy For Population Identification

Database Searched:

Library Literature on WILSONDISC

Data Coverage:

12/84 through 3/26/92

	Search Strategies: (WILSONLINE COMMAND)	Search Results: (ENTRIES)
1.	COLLEGE (BI) OR UNIVERSITY (BI) OR ACADEMIC (BI)	10373
2.	1 NOT SCHOOL LIBRARIES	10310
3.	2 NOT PUBLIC LIBRARIES	10184
4.	3 NOT SPECIAL LIBRARIES	10154
5.	4 NOT CORPORATE LIBRARIES	10150
6.	5 AND AUTOMATION	1198
7.	6 AND ENG(LA)	1098
8.	7 NOT BRV(RT)	1092
9.	8 AND 1984(YR)	61
10.	8 AND 1985(YR)	77
11.	8 AND 1990(YR)	189
12.	8 AND 1991(YR)	110

Appendix II. Subject Classification Scheme

I. Automation of Library Operations and Processes

A. Internal Library Operations and Information Services Applied with Information Technology

10 Administration

20 Public Services

- 21 Reference Services
- 22 Interlibrary Loan
- 23 Circulation Procedures
- 24 Collection Development

30 Technical Services

- 31 Technical Services in General
- 32 Cataloging Services
- 33 Acquisition Services
- 34 Binding and Bookbinding

40 Archives

50 Preservation

B. Aspects of Automation of Library processes

10 Study of Library Automation

- 11 Survey
- 12 Evaluation
- 13 Case Study
- 14 History

20 Management Aspects of Library Automation

- 21 Aims and Objectives
- 22 Administration

30 Human Aspects of Library Automation

31 Psychological Aspects

32 Teaching

33 Bibliographic Instruction

31 Library Collection of Automation

32 Serial Collection

33 Reserve Collection

40 Document Delivery in Automated Library

II. Information Technology and System

A. Information Technology Applied in Academic Libraries

10 Optical Technology

11 CD-ROM Use

12 Optical Disks Use

13 CD-ROM Networking

20 Networking

21 Information Networks in General

22 Local Area Network

23 Telecommunication

24 E-Mail System

30 Computer Software

31 Computer Programs in General

32 HyperCard

33 Programming Language

34 Database Management System

40 Computer Hardware

41 Computer Equipment

42 Computer Workstations

50 User-Friendly Technology

51 Front-End Systems

52 Expert System

60 Electronic Publishing

B. Information Systems Applied in Academic Library

10 Centralization of the Systems

11 Integrated Library Systems

12 Microcomputer Systems

20 Online Public Access Catalog Systems

21 Online Catalog in general

22 OPAC Systems in specific

30 External Information Systems

31 Information Services Systems

32 Bibliographic Utilities

40 Information Systems of Special Subjects

III. Perspective of End-User

10 End-user Perspective

11 End-User Searching

12 End-User Study

20 User Searching

21 Online Searching

22 Information Retrieval in Social Aspect

IV. Types of Academic Library

10 College and University Libraries in General

20 College and University libraries in Foreign Countries

30 Science and Technology Libraries

40 Medical Libraries

50 Law Libraries

60 Social Science Libraries

Appendix III. Code Book

Column	Variable Name	Variable Description
c1	Searched ID	Unique identification number for each sampled citation.
c2	Gender I	Gender of all writers including Editors. 0=unknown 1=Female 2=Male
C3	Gender II	Gender of all writers excluding Editors. 0=unknown 1=Female 2=Male
C4	Gender III	Gender of all single author and co-authors including Editors. 0=unknown 1=Female Single Author 2=Female Co-Author 3=Male Single Author 4=Male Co-Author
C5	Gender IV	Gender of all single author and co-author excluding Editors. 0=unknown 1=Female Single Author 2=Female Co-Author 3=Male Single Author 4=Male Co-Author
c6	Pages I	The length of the publication per author by pages.
C7	Pages II	The length of each sampled publication by pages.
C8	Periods	Publishing years of each sample. 1=1984-85 2=1990-91
c9	Subjects I	The first group of subjects are related to the library operations in the same aspect of automation. 0=Unidentified 1=Administration/automation 2=Circulation procedures/automation 3=Reference services/automation 4=Technical services/automation 5=Cataloging services/automation 6=Acquisitions/automation

Accounting and bookkeeping/automation
7=Selection /automation
Collection development/automation
8=Interlibrary loan/automation
9=Archives/automation
10=Bookbinding and bindings/automation
11=Preservation of library materials/automation

c10 Subjects II The second group of subjects are related to different aspects of the automation of library processes.
0=unidentified
1=Automation of library process/survey
2=Automation of library process /evaluation
3=Automation of library process/administration
4=Automation of library process/aims and objectives
5=Automation of library process/psychological aspects
6=Automation of library process/reserve collections
7=Automation of library process/serial records
8=Automation of library process/finance
9=Retrospective conversion
10=Bibliographic instruction
11=Automation of library processes/teaching
12=Automation of library processes/case studies
13=Automation of library processes/history
14=Document delivery

c11 Subjects III The third group of subjects are related to information technology applied in the library.
0=Unidentified
1=Optical technology
Optical data processing
Optical disks
CD-ROM/evaluation
CD-ROM/application/cataloging
CD-ROM/application/reference services
CD-ROM/aims and objectives
CD-ROM/user studies
2=Electronic publishing
3=Computer workstations
4=Database management systems/evaluation
5=Local area networks
6=Information networks
Networks of libraries
INTERNET
Computer network
Library networking
7=Front-end systems (gateway)
8=Expert systems
9=Computer programs
10=Programming language
11=Computer hardware

Computer terminals
12=Telecommunication
13=HyperCard
14=EM system
16=CD-ROM networking

c12	Subjects V	The fifth group of subjects are related to the information systems. 0=Unidentified 1=Integrated library systems 2=Microcomputers 3=Information systems /special subjects 4=Online catalog/general 5=Information service system BRS, DIALOG, InfoTrac, etc. 6=Bibliographic utilities OCLC, RLIN, etc. 8=Specific OPAC system NOTIS, VTLS, ORION, etc.
c13	Subjects IV	The fourth group of subjects are related to online searching from users perspectives. 0=Unidentified 1=End-user searching 2=Online searching 3=Information retrieval/social aspect 4=End-user perspective
c14	Subject VI	The sixth group of subjects are related to the types of the academic libraries. 1=College and University Libraries/ automation (in general) 2=College and University Libraries/ automation (Not in U.S.) 3=Medical libraries and collection/automation 4=Map libraries and collection/automation 5=Scientific and technology libraries/automation 6=Education libraries and collection/automation 7=Law libraries and collection/automation 8=Social sciences libraries and collection/automation

Coding Rules:
1. Match the terms appearing in the subject coverage and the title of the sampled citation to the terms used in the coding category.
2. If no terms in the subject coverage and the title matched the terms used in the coding category, value 0 is assigned.

Appendix IV : Coding Sheet

Coder Initial:

ID _____

C1: Searched Code _____

C2: Author Gender I _____

C3: Author Gender II _____

C4: Co-Author Gender III _____

C5: Co-Author Gender IV _____

C6: Page Per Author _____

C7: Page Per Sample _____

C8: Publishing Periods _____

C9: Subject I _____

C10: Subject II _____

C11: Subject III _____

C12: Subject IV _____

C13: Subject V _____

C14: Subject VI _____

NOTES: _____

_____

Appendix V. List of Journal Identified Among Samples

01 American Archivist
Audiovisual Librarian
Austrian Academic Research Libraries
Cataloging and Classification Quarterly
05 CD-ROM Professional (Continues: Laserdisk Professional)
CD-ROM Librarians
Christian Librarian
Collection Management
College and Research Libraries
10 College and Research Libraries News
Computers in Libraries
Database
Drexel Library Quarterly
Electronic Library
15 Government Publications Review
Herald of Library Science
IATUL Quarterly
Information Technology and Libraries
INSPEL
20 Information Reports and Bibliographies
Inform
Journal of education for Library and Information Science
Journal of Library and Information Science
Journal of Library Administration
25 Journal of Librarianship
Law Library Journal
LASIE
Libri
Library Administration and Management
30 Library Acquisitions
Library Hi Tech
Library Journal
Library Resources and Technical Services (LRTS)
Library Review

Library Software Review
Library Trends
Machintoshed Libraries
New Zealand Libraries
OCLC Micro
Online
Online Review
Program: Automated Library and Information System
Pacific Information
Publishers Weekly
Reference Service Review
Research Strategies
RQ
Serials Review
Serials Librarian
science and Technology Libraries
Show-me Libraries
Technical Services Quarterly
Technicalities
Wilson Library Bulletin

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